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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/659,778	09/10/2003	Edward P. Barth	FIS919990263US2	5616

7590 01/13/2005  
International Business Machines Corporation  
2070 Route 52  
Hopewell Junction, NY 12533

EXAMINER
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NOVACEK, CHRISTY L

ART UNIT	PAPER NUMBER
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2822

DATE MAILED: 01/13/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

## Office Action Summary

Application No.

10/659,778

Applicant(s)

BARTH ET AL.

Examiner

Christy L. Novacek

Art Unit

2822

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

### Status

- 1) ☒ Responsive to communication(s) filed on 15 December 2004.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

### Disposition of Claims

- 4) ☒ Claim(s) 20-24, 27 and 29-35 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 20-24, 27 and 29-35 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

### Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

### Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some \* c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
  - ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

### Attachment(s)

- ☐ Notice of References Cited (PTO-892)
- ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)  
Paper No(s)/Mail Date \_\_\_\_\_.
- ☐ Interview Summary (PTO-413)  
Paper No(s)/Mail Date \_\_\_\_\_.
- ☐ Notice of Informal Patent Application (PTO-152)
- ☐ Other: \_\_\_\_\_.

### **DETAILED ACTION**

This office action is in response to the amendment and request for continued examination filed December 15, 2004.

#### ***Continued Examination Under 37 CFR 1.114***

A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on December 15, 2004 has been entered.

#### ***Response to Amendment***

The limitations added to claim 20 are sufficient to overcome the Kudo (US 6,420,261) and Anand et al. (US 6,307,265) references. Therefore, the rejections of claims 20-24, 27 and 29 under 35 U.S.C. 102(e) as being anticipated by Kudo and Anand are hereby withdrawn.

#### ***Claim Rejections - 35 USC § 103***

The text of those sections of Title 35, U.S. Code not included in this action can be found in a prior Office action.

Claims 20-24, 27 and 29-35 are rejected under 35 U.S.C. 103(a) as being unpatentable over Venkatesan et al. (US 6,326,301, previously cited) in view of Anand et al. (US 6,307,265, previously cited).

Regarding claim 20, Venkatesan discloses a substantially planar substrate (12/14a/14b),

Art Unit: 2822

having underlying metal wires (14a/14b) therein, a substantially fluorine free insulating layer (18/20) on the substrate, having a height, and a fluorine containing insulating layer (22/23) directly on the fluorine free insulating layer, also having a height (Fig. 6-7; col. 5, ln. 55 – col. 8, ln. 35). A metal structure (32/34/36) of at least the combined height of the fluorine free layer and the fluorine-containing layer, is formed in layers 18, 20, 22 and 23 and extends to the substrate (Fig. 9; col. 5, ln. 55 – col. 8, ln. 35). The metal structure includes a trench and a via, where a bottom of the line and an upper portion of the via are contacted by the fluorine containing insulating layer (Fig. 9). Venkatesan discloses that the metal structure is a dual damascene interconnect made of a via and a trench, but does not specifically disclose that the trench equates to a line. Like Venkatesan, Anand discloses forming a dual damascene interconnect (Fig. 61-64). Anand shows that the interconnect is formed by creating a via hole and creating a trench that extends in a direction perpendicular to the depth of the via, and subsequently filling the trench and via with a metal structure so as to form a metal line within the trench opening (Fig. 61-64). At the time of the invention, it would have been obvious to one of ordinary skill in the art to form the metal structure in the trench opening of Venkatesan such that it is a line, as shown by Anand, because such a dual damascene structure is well-known and conventional in the art.

Regarding claim 21, Venkatesan discloses forming a capping layer (15/16) on the substrate prior to the formation of the substantially fluorine free insulating layer (Fig. 6).

Regarding claim 22, Venkatesan discloses that the fluorine containing insulating layer is made of fluorinated silicon oxide (fluorine-doped TEOS) (col. 5, ln. 55-62; col. 13, ln. 33-38).

Regarding claim 23, Venkatesan discloses that the substantially fluorine free insulating layer is made of undoped TEOS (silicon glass) (col. 5, ln. 55-62).

Regarding claim 24, Venkatesan discloses that the capping layer is made of silicon nitride (col. 6, ln. 30-32).

Regarding claim 27, Venkatesan discloses that the metal structure extends through the capping layer such that the height of the structure is greater than the heights of the fluorine free and fluorine containing insulating layers (Fig. 9).

Regarding claim 29, Venkatesan discloses that the metal structure is in contact with the underlying metal wires through the capping layer (Fig. 9).

Regarding claim 30, Venkatesan discloses that the middle portion of the via is contacted by the fluorine free insulating layer (Fig. 9).

Regarding claim 31, Venkatesan discloses that a lower portion of the via is contacted by the fluorine free layer and the capping layer (Fig. 9).

Regarding claim 32, Venkatesan discloses that the trench (line) has a height less than the height of the fluorine containing insulating layer (Fig. 9).

Regarding claim 33, Venkatesan discloses that the via has a height greater than the height of the fluorine free insulating layer (Fig. 9).

Regarding claim 34, Venkatesan discloses that the metal structure has a height equal to the height of the line plus the height of the via (Fig. 9).

Regarding claim 35, Venkatesan discloses that the height of the fluorine free insulating layer is substantially less than the height of the via (Fig. 9).

***Response to Arguments***

Art Unit: 2822

Applicant's arguments filed December 15, 2004 have been fully considered but they are not persuasive.

Regarding the rejection of claims 20-24, 27 and 29 as being anticipated by Venkatesan, Applicant argues that Venkatesan allegedly fails to disclose the bottom of a line and an upper portion of the via contacting the fluorine containing insulating layer. While it is true that Venkatesan does not specifically state that the metal structure within the trench opening is "a line", it would have been obvious to one of ordinary skill in the art that the metal in the trench of a dual damascene interconnect corresponds to a line. Venkatesan shows, in the embodiment of his invention depicted in Figures 6-9, that the bottom of the trench (line) and the upper portion of the via contact the fluorine containing insulating layer.

### ***Conclusion***

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Christy L. Novacek whose telephone number is (571) 272-1839. The examiner can normally be reached on Monday-Thursday and alternate Fridays 7:30 - 5:00.


If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Amir Zarabian can be reached on (571) 272-1852. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Art Unit: 2822

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

CLN

January 5, 2005



**AMIR ZARABIAN**  
**SENIOR PATENT EXAMINER**  
**BIOLOGY CENTER 2800**